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A Complex View of Industry 4.0

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Abstract

This article is focused on the importance and influence of Industry 4.0 and consequently the Internet-connected technologies for the creation of value added for organizations and society. The contribution of the article is mainly conceptual. With the development of the Internet, the Internet of things that is central to the new industrial revolution has led to "Industry 4.0." The aim of this article is to synthesize the known theory and practices of Industry 4.0, and to investigate the changes that will result from Industry 4.0 and with the development of the Internet of things.

Keywords

Internet, Internet of things, costumer behavior, Industry 4.0

Introduction

The phenomenon of Industry 4.0 was first mentioned in 2011 in Germany as a proposal for the development of a new concept of German economic policy based on high-tech strategies (Mosconi, 2015). The concept has launched the fourth technological revolution, which is based on the concepts and technologies that include cyber-physical systems, the Internet of things (IoT), and the Internet of services (IoS; Lasi, Fettke, Kemper, Feld, & Hoffmann 2014; Ning & Liu, 2015), based on perpetual communication via Internet that allows a continuous interaction and exchange of information not only between humans (C2C) and human and machine (C2M) but also between the machines themselves (M2M; Cooper & James, 2009). This communicational interaction influences the establishment of knowledge management 4.0 (KM 4.0; Dominici, Roblek, Abbate, & Tani, 2016).

If the trend of the social customer relationship management (CRM) integrates classical CRM and social media to provide value added for organizations and customers (Marolt, Pucihar, & Zimmermann, 2015; Roblek, Pejić Bach, Meško, & Bertoncelj, 2013; Rodriguez & Trainor, 2016), in the case of KM 4.0, the trend is leading toward the establishment of a communication channel for the continuous exchange of information about needs and individual situations in real time to e-retailers, health care workers, manufacturers, housekeepers, coworkers, customers themselves, energy suppliers, and so on. It is important to emphasize that in most cases, the exchange of information will be between machines themselves. Machines are streaming data via wireless sensors and sending these data to the smart service/product providers' centers, where large amounts of data are analyzed. The purpose of such automation is the individual customer-oriented adaptation of products and services that will increase value added for organizations and customers (Kagermann, 2015; Yu, Subramanian, Ning, & Edwards, 2015). The results will be shown by the permanent control over the individual life that allows the personalized service/product offer in real time, and consequently leads to customer loyalty if trust is established between the customer and the organization and the customer is satisfied with their products/services (Andersson & Mattsson, 2015; Dominici et al., 2016).

The period of the fourth industrial revolution will be marked by the full automation and digitization processes, and the use of electronics and information technologies (IT) in manufacturing and services in a private environment. The consequences of the development of technologies such as 3D printing, the development of online sales services such as car services, medical examinations from home, ordering food directly sent from the store to the refrigerator, and so on, will have a significant impact on changes in small and medium-sized enterprises (SME; Sommer, 2015).

Through the development and integration of the individual person in the use of cyber-physical systems, the IoT and the IoS have led to the emergence of changes in consumers' behavior related to 4.0 (Dominici et al., 2016). Organizations have to understand how connected consumer products or services can serve as a critical foundation for businesses to identify customer's opinions and sociodemographic and psychological factors that influence their decision making in regard to using connected

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Figure 1. Research approach.

products. Industry 4.0 organizations that have not yet moved from conventional marketing to content marketing now have—when the Internet-connected technologies are still in the development and introduction phases—their last opportunity to change, and lead their marketing strategies into line with market competition and technological capabilities (Court, 2015; Rocco & Bush, 2016). KM 4.0 processes will allow marketing strategists to improve accuracy, obtain relevant and valuable content from customers, and reply to them in real time constantly, with the intention of changing or enhancing customer behavior. Accordingly, information organizations can prepare strategies (e.g., product or service developments, marketing strategies) that will help them to retain old customers and obtain new customers.

Based on these anticipated developments, the following research goal has been set: to present the known theory and practices of Industry 4.0. The research question was set as follows:

> **Research Question 1:** What value can be expected from Industry 4.0 and the development of the IoT?

This article is focused on the importance and influence of Industry 4.0, and, consequently, the Internet-connected technologies' creation of the value added for organizations and society. The contribution of the article is mainly conceptual and has been achieved in six phases: After the introductory part of the article, the second part includes research methodology. The third explores the theoretical frameworks of Industry 4.0. The fourth discusses consumer behavior relating to 4.0 in the case of the future IoT transformations. Conclusions include managerial and practical implications, summary of the research and limitations, and proposals for future research.

Research Method

The purpose of this article is to determine what has been researched so far about the importance of Industry 4.0, and its impact on the changes and adoption in organizations and the human environment that results in value added. To achieve this objective, a comprehensive review of journal articles, conference papers, books, and edited volumes was performed.

Industry 4.0 is still in the early stages of implementation in industry, the human environment, and scientific research. The German government, some of its companies, universities, and research institutions are currently trying to develop fully automated, Internet-based "smart" factories. Such an early stage example is the Amberg plant, where most units in this 100,000-plus square-foot factory are able to fetch and assemble components without further human input (Hessman, 2013). The German government stimulates the political economic initiative to help industrial manufacturing maintain its competitive edge against the labor-cost advantages of developing countries and resurgence in U.S. manufacturing (Weber, 2015). The European Union has therefore decided to encourage research into the field of smart technologies. The research program Horizon 2020 offers funding programs for research and development projects such as smart cities and communities' information, strategic roles of smart cities for tackling energy and mobility challenges, analyzing the potential for wide-scale rollout of integrated smart cities and communities' solutions, and so on (European Commission, 2015). Given that Industry 4.0 is still in a conceptual state and intends to include a very dynamic technological concept involving multiple industries (IT, mobility, energy providers, construction, medicine, the textile industry, etc.), publications of interest include scholarly journal articles from information systems and marketing disciplines as well as conference proceedings from these specific disciplines.

As the topic of the article is relatively new and relevant, a review of the literature on Internet 4.0 and IoT, with the objective of bringing to the fore the state of the art and initiate further research, is of the utmost importance. To provide a comprehensive bibliography of the academic literature on Industry 4.0, the following available online journal databases were searched: EBSCOhost, ProQuest, ScienceDirect, Web of Science, Scopus, and Google Scholar. The relevant articles were included and analyzed by topic area. The research approach is presented in Figure 1.

Theoretical Framework of Industry 4.0

The Internet transformation of the digital industry is still in progress, but artificial intelligence, big data, and connectivity indicate the certainty of a new round of digital revolution. Industry 4.0 is on the way and will have an important influence on the complete transformation of industry because it represents progress on three points (Almada-Lobo, 2016; Schlechtendahl, Keinert, Kretschmer, Lechler, & Verl, 2015):

1. Digitization of production—information systems for management and production planning;
2. Automation—systems for data acquisition from the production lines and using machines;

3. Linking manufacturing sites in a comprehensive supply chain—Automatic Data Interchange.

Characteristic of Industry 4.0 is increased competitiveness through smart equipment, making use of information about high-wage locations, demographic changes, resources, energetic efficiency, and urban production (Heck & Rogers, 2014).

The four key components of Industry 4.0 are cyber-physical systems (connections between the real and virtual world), the IoT, the IoS, and the smart factory. Machine communications (M2M) and smart products are not considered as independent parts. The M2M is an enabler of the IoT. Smart products are a subcomponent of the cyber-physical systems (Greengard, 2015; Kagermann, 2014).

The rise and expansion of Industry 4.0 with its current fundamental concepts (Table 1) are based on the assumption of increasing global urbanization (Pejić Bach, Zoroja, & Bosilj Vukšić, 2013). Demographic changes are becoming a challenge for urban renewal and development, which will have to enable the infrastructure of residents for ensuring their quality of life and sustainable orientation (Etezadzadeh, 2015; Nahtigal & Bertoncelj, 2013).

What actually presents the phenomenon of Industry 4.0, and in which parts of the economy and the human environment it is expanding, is probably most evident from the expressions with which it is associated. These fundamental concepts of Industry 4.0 and the explanation of their content are shown in Table 1.

As suggested by Table 1, to create a smart project, smart technologies and devices have been used. A critical component for the success of urbanization and societal development will be smart technology. It is predicted that the purpose of the technology will be aimed at collecting and analyzing data from the human environment to design a circular economy, increase revenues, lower capital spending, and improve services and mobility (Lasi et al., 2014).

One of the pitfalls of transition may be in the mind-set of those accustomed to existing patterns shifting to the new platform. But this need not be so, for it is a transformation of the organizations and its processes. Some firms responsible for the implementation of digitization already have managerial positions (chief digital officer); the background of these managers is more in business than IT (Hansen & Sia, 2015). Yet obviously, technology is setting a new tempo. People will have to gain knowledge that will enable the development of "digital thinking" so that they may manage the process in a new way. Those who do not will be able to read the data, analyze them, and determine their nature independently but will be slower than competitors. Employees will also require more autonomy and be allowed independent decision making (Scheer, 2012).

One positive aspect of Industry 4.0 is the value creation effects from gains in efficiency and new business models, but technological change may have both a positive and a negative impact on employment. The challenge will be the restructuring of jobs because some of the less-demanding occupations will quickly disappear (Kane, Palmer, Phillips & Kiron, 2015). The productivity gains achieved by the use of smart technologies may help to secure jobs and boost consumer demand with additional income (compensation effect), but the use of new production technologies and processes may also destroy jobs (redundancy effects). There are concerns that the redundancy effect from Industry 4.0 will predominate in the long run, leading to what is known as technological unemployment (Hungerland et al., 2015). What is relatively certain is that the job profiles at many workplaces are set to change. This means that major conversion and adaptation measures will also be necessary in the fields of education and employee development (Weber, 2015).

In regard to Industry 4.0, one cannot limit thinking to robotics and the automation of production because it is a digitization of business processes as a whole; it involves the adoption of a contract over the procurement of materials, and how the product "gets" through production and is finally delivered to the customer. In this area, we expect automating processes that will require a certain automaticity of the workers. People will still have to use their brains. Added value will be found in new products and new solutions—handling figures is not productive work (Kane et al., 2015; Schlechtendahl et al., 2015).

Industry 4.0 and Rise of the IoT

As stated, the development of IoT, considered by some a new industrial revolution, has been called by Germany as "Industry 4.0" (Dais, 2014). IoT represents a fundamental concept in the integration of all smart devices that are parts of major smart projects, and due to limitations of research, the article is focused on the importance of IoT in the context of Industry 4.0.

The digitization that includes the Internet and mobile technologies with its high-speed connectivity has helped bring about the change of established business models (Roblek et al., 2013; Zoroja, 2015). Manufacturers of IT products/services and manufacturers of traditional products have found themselves faced with the issue of how to stimulate the regrowth of demand. The answer was found in the development of a new technological period, which is characterized by the fact that the economic and social activities are globally interconnected, which facilitates technology platforms such as the Internet, mobility, and sensor systems (Bauer, Patel, & Veira, 2014; Krapež, 2015). This has led to the "complexity cross"—community interactions, digital media, hardware, sensors, clouds, and microprocessors (Peterlin, Dimovski, Uhan, & Penger, 2015; Porter & Heppelmann, 2014). In a simple way, the IoT is of relevance if any device or even a living being is connected to the Internet.

Each object can potentially be connected and networked; it will be necessary that within enterprises, ways of thinking

Table 1. Fundamental Concept of Industry 4.0.

Expression/fundamental concept	Explanation
Smart factory, smart manufacturing, intelligent factory, factory of the future	The smart factory will be more intelligent, flexible, and dynamic. Manufacturing will be equipped with sensors, actors, and autonomous systems. Machines and equipment will have the ability to improve processes through self-optimization and autonomous decision making.
New systems in the development of products and services	Product and service development will be individualized. In this context, approaches of open innovation and product intelligence, as well as product memory, are of outstanding importance.
Self-organization	In manufacturing, processes change in the entire supply and manufacturing chains. These changes will have an impact on changing processes from suppliers to logistics and to the life cycle management of a product. Along with all these changes, manufacturing processes will be closely connected across corporate boundaries.
	These changes in supply and manufacturing chains require greater decentralization from existing manufacturing systems. This fits with a decomposition of the classic production hierarchy and a change toward decentralized self-organization.
Smart product	Products are inserted with sensors and microchips that allow communication via the IoT with each other and with human beings. Cars, T-shirts, watches, washing powder, and so on, are set to become "smart" as their makers attach sensors to their packaging that can detect when the product is being used and can communicate with smartphones when scanned. Smart products are eliciting the question of invasion of privacy and, consequently, personal safety.
New systems in distribution and procurement	Distribution and procurement will increasingly be individualized.
Adaptation to human needs	New manufacturing and retailers' systems should be designed to follow human needs instead of the reverse. It is suggested that these systems may well be a combination of robotic-like tools such as personal intelligent agents, such as Siri, Viv, Cortana, Google Now, and others, and the IoT. That can become the dominant model of the interaction between buyers and sellers.
Cyber-physical systems	Systems will integrate computation, networking, and physical processes. Embedded computers and networks will monitor and control the physical processes, with feedback loops where physical processes affect computations and vice versa. An example is control of vital human functions that allow urgent health care through mobile applications, sensors in clothing, and sensors and surveillance cameras in flats.
Smart city	Smart city is defined as a city that comprises six factors in its development policy: smart economy, smart mobility, smart environment, smart people, smart living, and smart governance. It is the product of accelerated development of the new generation IT and knowledge-based economy, based on the network combination of the Internet, telecommunications network, broadcast network, wireless broadband network, and other sensor networks with the IoT as its core.
Digital sustainability	Sustainability and resource efficiency are increasingly in the focus of the design of smart cities and smart factories. It is necessary to respect ethical rules when using private information. These factors are fundamental framework conditions for successful products.

Source. Hessman (2013); Ivanov, Dolgui, Sokolov, Werner, and Ivanova (2016); Neirotti, De Marco, Cagliano, Mangano, and Scorrano (2014); Vaidyanathan and Aggarwal (2015); Whitmore, Agarwal, and Da Xu (2015).
Note. IoT = Internet of things; IT = information technology.

change and different business models be designed involving the Internet and connectivity (Pejić Bach, 2014). In this mode, the "smartness economy" will change the way of creating added value. Sources of production may change, but additional services will be accessible via the Internet. This can already be seen in smart mobility, automobile leasing, and various examples relating to the industrial Internet, mechanics, and heavy industry; in cases of smart homes, which, for example, may include, along with a TV, a fridge and a game console equipped with an IP number and connected to the IoT (Martin, 2015).

These days the Internet relates to more than a billion people through personal computers, tablets, and smartphones. It is predicted that in the future, they will be linked through small devices that can be simple or complex sensors and microcomputers, which will have the possibility of autonomous

Table 2. Differences Between Classical Knowledge Processes and the IoT Knowledge Processes.

Classical knowledge processes	Internet 2.0 based knowledge processes	IoT knowledge processes
Knowledge based on the data acquired from the intranet, CRM. Data are saved in local servers.	Information is accessed and stored via clouds and platforms such as Google and Facebook	Big data acquired directly from the things and customers. Analyzed and saved in clouds
Local time and personal limited access	Business or private content is available on any device, any place, any time	Real time. Content is available online. No limitations for sharing information between people or things
Organization limited networking; information sharing and discussion via email or intranet	Internet 2.0 provides online relations between the customer and supplier. The discussion is limited to the matter of content and physical data entry	Information sharing and collaboration via wireless communications between people, between people and things, and between things

Note. IoT =Internet of things. CRM = customer relationship management.

operation without the need for an additional power supply for several years or decades, and, most importantly, the devices will connect (mostly through wireless) to the Internet (Lee & Lee, 2015).

The smart, connected products breakthrough is evident in all manufacturing branches. Companies that were not engaged in the manufacture of products in the field of development of the IoT are now entering this market (Thomas & Wilkinson, 2015).

According to the literature, application categories of the IoT can be classified into the following fields:

- Smart infrastructure: Smart devices are incorporated into buildings. They can improve flexibility, reliability, and efficiency in infrastructure operation. Their added value is in reduced costs and manpower requirements, as well as the enhancement of safety. Apple has developed a smartphone application for managing the "connected" home. Such applications allow control over door locks from remote devices from any Internet-connected source, as well as such things as adjusting a thermostat, controlling the supply of food in the refrigerator, and so on (Baunsgaard & Clegg, 2015). They will have an important role in smart cities' mobility control (e.g., monitoring parking availability, traffic control).
- Health care: Sensors (e.g., integrated in the house or smartphone applications) monitor the patients and send information to doctors (Pang et al., 2015). The textile industry began producing T-shirts capable of measuring calories burned, movement sensing, heart rate, and so on. These data are transferred to smartphones (Upton & Stein, 2015).
- Supply chains/logistics: The IoT can improve logistics and supply chain efficiency by providing information that is more detailed and up to date (Flügel & Gehrmann, 2009) than currently, mitigating the bullwhip effect (Yan & Huang, 2009), reducing counterfeiting, and improving product traceability (Zhengxia & Laisheng, 2010).
- Security and privacy: IoT devices are wireless, and in the public network, information exposure to intrusion increases, and therefore, data transfer should be encrypted. The transfer of data and their archiving in clouds must not be subject to unauthorized access (Zhou, Cao, Dong, & Lin, 2015).

IoT in the Framework of KM

Kagermann (2014) defined the IoT and the IoS as parts of the manufacturing process that has ignited the fourth industrial revolution. The IoT includes "things" and "objects" like radio-frequency identification (RFID) sensors that will send storage, processing, and analysis information, and smartphones that interact with each other and cooperate with smart components (Dutton, 2014).

This leads to a new functionality of KM processes (Table 2) and involves new functionalities for CRM, customer support systems, and enterprise resource planning (ERP).

The new role of IoT CRM will be to help companies better understand their customers and offer proactive support by leveraging IoT data to create improved, automated customer support environments. Companies will have the opportunity to manage customers with customer support systems in real-time marketing promotions on demand pricing, next generation customer service, and in-store experiences (Goldenberg, 2015).

ERP regarding the IoT is connected with establishing smart factories that involve manufacturing equipment that is capable of reading and storing data about activity related to production, energy, time, and other process-related parameters. The IoT allows monitoring of all manufacturing processes with the purposes of maintenance, production quality, and energy management optimization. The goal of the smart factory is to connect all smart devices with higher decision making (Dutta & Bose, 2015). This connectivity from the device level to the organizations' decision making–level connection involves connecting smart factory devices to manufacturing execution systems (MESs), energy management

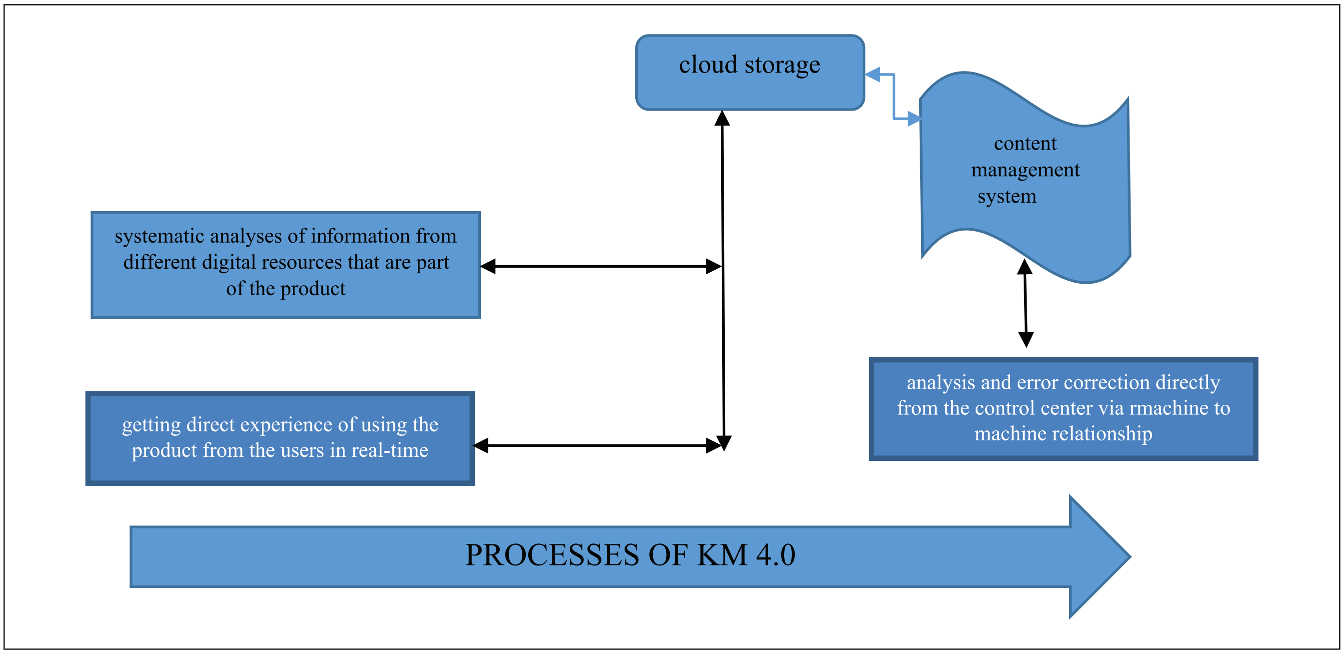

Figure 2. IoT—prediction for a KM 4.0.
Source. Adapted from Krapež (2015).
Note. IoT = Internet of things; KM = knowledge management.

systems (EMSs) or ERP systems (Gamarra, Guerrero, & Montero, 2016).

If KM in the period of its creation proceeded on the assumption that there is a benefit to knowledge upgrading, all that is needed is to capture, decode, and share. At this stage, the purpose of KM is to provide a means to increase the development of knowledge and transfer it into practice. The first period of KM emphasizes the integration of knowledge (McElroy, 2003).

The second generation of KM is based on the assumption that it is necessary to produce knowledge in the social environment. The knowledge thus generated through processes of individuals and exchange of knowledge also needs mechanisms to assure its accuracy. This process at an organizational level is defined as the knowledge life cycle. The basic characteristic of second generation KM is that it includes formation and integration of knowledge (McElroy, 2003; Nonaka, 1998).

The emergence of the Web 2.0 has had a significant impact on the development of the third stage of KM. During the period after 2005, with the development of social media, web portals became integrated (Hanna, Rohm, & Crittenden, 2011). Knowledge thus became available outside organization and management—which is one of the critical factors of business success (Roblek et al., 2013).

Von Krogh (2012) proposed the theory that the Web 2.0 applications are not necessarily included in the context of KM but are simply a means of enabling access to knowledge. By integrating information and communications technology (ICT) into products, the Von Krogh theory is gaining ground and is a basis for the understanding of fourth generation KM. The IoT has influenced the development of KM 4.0 (Figure 2) that is arising from the phase of integration between people and people with documents, and passes to the phase of connecting between devices. KM processes are also located between the consumer and the manufacturer or service provider.

Industry 4.0 is based on mobile computing, cloud computing, and big data. The importance of cloud computing and mobile computing for Industry 4.0 lies in the provision of services, which can be accessed globally via the Internet. Services can easily be integrated and used.

For the establishment of the IoT and the course of the processes of KM 4.0, companies set up a circuit between product and service: (a) RFID, (b) wireless sensor networks (WSN), (c) middleware, (d) cloud computing, and (e) IoT application software (Lee & Lee, 2015). This system can operate with the help of both people and artificial intelligence. The data that are collected with the help of these systems are saved in clouds. Products integrated with cloud computing in the field can provide data that enable a predictive maintenance and provide information about optimization possibilities in production. The use of integrated networking and integration of products into Internet data will allow for far reaching possibilities to collect data (Schmidt et al., 2015). Instead of single data points or short intervals, a continuous stream of data is now available. The huge amounts of data available can now be used to continuously analyze and optimize production. This enables fostering of predictive analytics (Abbott, 2014). Such a system is based on big data analytics, which enables, for example, the informing of vehicles on a given road, the distances between them, events in front of them, weather conditions, and so on. The drivers of vehicles with the help of sensors and connectivity between vehicles receive notice of current dangers on the road, for instance (Ho & Spence, 2012; Kausar, Eisa, & Bakhsh, 2012).

Anytime, anywhere, and through any medium ("any place," "any time," "any medium") has long been a vision impelling progress in communication technologies. In this context, wireless technologies play a key role in such a way that the ratio between the number of transmitters and human beings is approximately 1:1. In any case, we are reducing the size, weight, power consumption, and price of transmitters brought into a new era in which the number of stations is growing rapidly. This enables the integration of transmitters in almost any object and also adds the concept of "any thing" vision, which leads to the concept of the IoT (Atzori, Iera, & Morabito, 2010). Because each object can potentially be connected and networked, there must always be awareness in companies of the need to change the way of thinking and to find different business models that will be designed based on the Internet and connectivity. In this mode, the "innovation economy" is going to change the way of creating added value (Nanry, Narayanan, & Rassey, 2015). In the foreground, processes will no longer be handled by the usual services, sending people to the object; with the IoS, the users will be able to access online (Pang et al., 2015).

The automotive industry has been among the first to perceive the opportunities of the Internet and the connections among devices. Mid-range cars offer Long-Term Evolution (4G LTE) connectivity between the car and in-car devices (smart devices of passengers and in-car devices), which is useful in connecting to the Internet and the outside world while driving, changing the car into a mobile office. The smartphone can be connected to the control system of the car and transmit data to the screen, which can be controlled by the driver and also adapt to individual functions. Cars can be upgraded with a smart key—the car detects when the key is in the vicinity and starts the engine, unlocking the door when the owner (with the key in a pocket or purse) is sufficiently close. According to previously stored data, the smart key can also set the positions of the seat and steering wheel, and start the car when the driver is behind the wheel (Gerla, Lee, Pau, & Lee, 2014).

Until full implementation and universality of the IoT, of course, there will still be some obstacles. One of the biggest is to establish a developed infrastructure associated with large investments in construction and maintenance. There are also challenges in adopting standards in regard to connectivity devices (as well as data sharing, security, and privacy; Chabridon et al., 2014). Finally, it is also reasonable to be concerned about Orwellian surveillance—not only because of the general traceability, which simply cannot be avoided, but also because of the ownership and protection of data clusters, which are devices exchanged, processed, and stored. Systems of protection from unauthorized intrusions will have to become much more elaborate because *things* will monitor certain vital functions in the care of other machines or devices (Roman, Zhou, & Lopez, 2013).

Consumer Behavior 4.0 in the Case of Future IoT Transformations

Industry 4.0 is rapidly changing the relations between consumers and producers (Wynstra, Spring, & Schoenherr, 2015) aiming to change perspectives, including customer adaptability to smart product characteristics.

The IoT is a new expression of the relationship between customers and producers; Forrest and Hoanca (2015) predict that manufacturers and retailers will continue to dominate consumers and their purchasing decisions. The authors believe that robots or other M2M interactions will likely be the end game in regard to the marketer/retailer and consumer interactions in the future. The relationship will include the manufacturer of the finished product and multiple partners, who will ensure the development of built-in components and software (Forrest & Hoanca, 2015). This cooperation is influencing the rebuilding of the knowledge value chain (Bertoncelj & Kavčič, 2011). Other prognosticators are no less ambitious. They often suggest that the systems may well be a combination of robotic-like tools such as personal intelligent agents, like Siri, Viv, Contana, Google Now and others, with the IoT. That, they argue, will become the dominant model of the interaction between buyers and sellers (Vaidyanathan & Aggarwal, 2015).

On the demand side, customers will increase their awareness in regard to the importance of the quality and reliability of the acquired and given information and technical condition of the products. This will affect the accumulation and analysis of information in real time and, consequently, influence coming guidelines of value creation for the customers (Espejo & Dominici, 2016). It establishes the question of how the customers will adapt to the new technologies connected to the products (Lamberton & Stephen, 2015; Zoroja, 2011).

In doing so, we cannot ignore the evolutionary role of technology, which allows the consumer access to resources such as a network-based power crowd. Two years ago, we talked about the use of the Internet 2.0 for marketing purposes, but now we are entering an age of marketing through the use of functions such as the IoT and IoS, which are becoming the new tools within CRM (Marolt et al., 2015). Thus, the manufacturer of a smart vehicle is provided guidance in obtaining direct consumer experience. Direct contact with the consumer engaged in Industry 4.0 will allow for the assessment and the perceived value along with focus on the genuine customer value of the entire set of services related to the management of smart vehicles.

Parallel to the expansion of the IoT technologies is an increasing fear of them. Most troubling aspect regarding the IoT is the control of the increasing data collected (Roman et al., 2013). There is concern as to how to ensure a sufficient level of privacy and security that will prevent unauthorized access and use of data. Nowadays, when business ethics is so low that even business partners do not respect agreed terms of doing business, such as terms of payment (Šalamon, Milfelner, & Belak, 2015), we can suspect that they (as well as third parties) would take advantage of the opportunity to unauthorized access to each other's data. Here, we come across the same problem as with today's use of the Internet, where we have real users that are much more vulnerable. Most home routers are very vulnerable to various invasions that delete, change, or outrightly steal data. In terms of privacy, this is a considerable problem involving data providers of free electronic mailboxes, calendars, navigation, storage, and various applications, and the questions regarding whether and where operators sell our files. Unfortunately, security and privacy cannot be free.

Conclusion

In this article, we focused on the importance and influence of Industry 4.0 and the Internet-connected technologies for the creation of value added for organizations and society. Indeed, the fourth industrial revolution is happening now; it requires from each company and each individual a rethinking of what is expected or desired from the smart project and smart Internet-connected devices. The current study represents an important theoretical contribution to the understanding of Industry 4.0 and the Internet-connected technologies. The findings were based on the review of the literature and confirmed the assumption that the business value of the IoT technology is significantly higher than is reflected by the number of devices. The trend of KM 4.0 is leading toward the establishment of a communication channel for the continuous exchange of information, in most cases between machines themselves. The purpose of such automation is the individual customer-oriented adaptation of products and services that will increase value added for organizations and customers (Kagermann, 2015; Yu et al., 2015). Therefore, the IoT technology enables the creation of completely new products, services, and business models that promise gains in virtually all industries. An interesting example of the potential of the IoT, which is in the early stages of application in practice, can be found in the automotive industry. The McKinsey study (Gao, Russel, & Zielke), shows that insurance companies and car owners could save $100 billion a year by reducing accidents with the help of embedded systems that detect and avoid imminent collision. The IoT will enable new business models in insurance, such as, for example, car insurance, which is based on actual usage, calculated on the basis of information obtained in real-time driving (Dutton, 2014).

One particular limitation of the article is that no survey was made; but the intention has been to review existing literature and assess positions on the basis thereof. Further studies should be focused on the effect of technology on the ecosystem as well as on extend and trend of use of Industry 4.0 in different countries with different and in the same geopolitical environment in the same way as several economic parameters are usually analyzed.

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